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A Temporal Changes of land use pattern in Jamui district: A Geographical study

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Abstract

Land use change is not new phenomena but it begins from pre-civilization. The change of land use of any place varies due to the parental rock, topography, spatial distribution of sunshine, rainfall, drainage condition, minerals, human habitation etc. These elements affect the agricultural land as well as socio-economic aspects. Significant spatial and temporal changes have been noted in the land use pattern in Jamui district. This study tries to find the impact of agricultural and other land use pattern due to change of human behaviour and climatic condition. The nature of economic activities is mainly influenced on changing land use pattern in this region. Secondary and tertiary sectors of economy grew much faster than primary sectors resultant in a gradual shift of land from agricultural uses to non-agricultural uses.

Keyword- Land use, Land utilization, Topography, Socio-economic,

Introduction

Land use pattern of any region are subject of human action which relies on economic & cultural activities and prevailing in the respective region to manage the human lifestyle and ecosystem. Country like; India the land use pattern is governed from different requirements and visions related to development in terms of socio-economic and socio-political. As we know people are belongs to different cultural background which is driven by different psychological behaviour pattern and differentiate the land being used locally. Therefore Human being are always tried to manage, grab and modify their shelters and reaching very close to abundant resources and also they are always try to find out the solution or answer to the requisite questions, in the past where people was always focused or had required basic things, first it was the food grain production (for surviving) and second the trade of productive things like crops etc. because of their conquest of development. Land which basic factor of production as well as constitutes permanent source of several phenomena such as settling human being, doing agricultural work, using forestry for wood and fuel. As we know

that land utilisation is a process of finding or categorisation for specific objectives. Utilization of land is governed by natural as well as human environment

Methodology

The present research is based on secondary data source and data collected for two time of periods *i.e.* 2000-01 and 2017-18. Which is extract fromBihar through Figure Jamui, at the district as well as block level as district and block are the study unit. Simple Statistical technique MS-Excel 2013 use for manipulating data. Using, Arc GIS software for prepare location map of the study area.

Study Area

District Jamui situated in south-eastern part of Bihar state. It was formed as a district on 1991 as a result of its separation from Munger which lies between North to South between 86°16'9'' E and 25°16'58'' N to 86°24'32'' E and 23°50'54'' N. It extends East to West between 86°41'17'' E and 24°20'44'' N to 85°21'39''E and 24°52'17'' N. The district administrative boundary bounded by Jharkhand in south-east, south-west and south, in the east by Banka district, in the north-east by Munger district, in the north to north-west by Lakkhisaraiand in the west by Nawada district. Most of the part especially southern of the study area has mountainous and covered by natural vegetation which is came under the Chota Nagpur platue.Hills of the study area are considered to be the out–laying extension of Vindhya Range. Kiul and Ulai are the chief rivers of the district besides these river many tributary and sub tributary are originated from Nagpur platue. There are three major irrigation dam Garahi, Nagi and Nakti dam situated in the southern hilly terrain of the study area.

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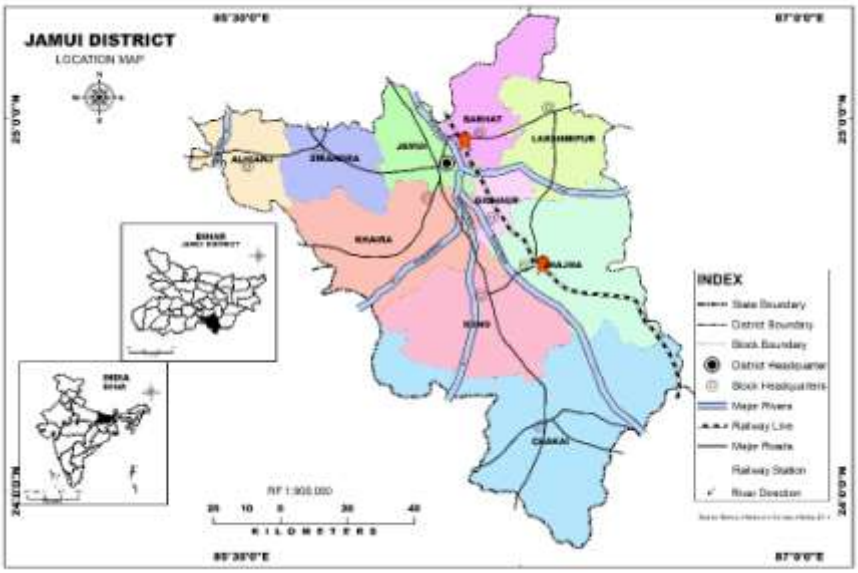

Objectives

The main objective of this research paper is toknow the land use and land utilization change of the Jamui district from 2000-01 to 2017-18.

General Land use in Jamui District

Landuse pattern in the Jamui District is been under the dynamic change after 2001 to 2019 the major component, which further made impact on the Agricultural land expansion which is subject to change in the demography. The changing demographic prospects exert pressure on the land use pattern and change the agricultural pattern, its productivity and production. In view of the ratio of total agricultural land to total geographical area (TGA) of Jamui in 2000-01 was 3052.89 Km² (table 1) and the graph 1 shows the general land use pattern in (2000-01) which includes Forest (30%), Cultivable Wasteland (3%), Current Fallow Land (11%), Other than Fallow Land (6%), Barren and Uncultivated Land (9%),Land put to non-agricultural Land (13%), area under pasture and area under bush, forest and garden (1%) and Net sown area (26%). Whereas in 2017-18 changes can be seen in the general Land use of the district under which includes Forest (30%), Cultivable Wasteland (3%), Current Fallow Land (11%), Other than Fallow Land (6%), Barren and Uncultivated Land (9%),Land put to non-agricultural Land (13%), Area under Pasture and Area under bush, forest and Garden (1%) and Net sown area (26%) (table 1).

Table 1, Landuse distribution and changes in Jamui district (2001 to 2017)

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S.n.	General Landuse	Total Reported Area (Km²)		Change	
		2000-01	2017-18	Km²	%
1	Forest	928.5	928.5	0	0
2	Cultivable Wasteland	104.82	102.81	-2.01	-1.91
3	Current Fallow Land	326.08	385.41	59.33	18.19
4	Other than Fallow Land	169.63	159.79	-9.84	-5.80
5	Barren and Uncultivated Land	289.01	285.67	-3.34	-1.15
6	Land put to non-agricultural Land	392.68	445.45	52.77	13.43
7	Area under Pasture	17.25	16.37	-0.88	-5.10
8	Area under bush, forest and garden	19.16	21.40	2.24	11.69
9	Net sown area	805.71	707.44	-98.27	-12.19
	Total	**3052.89**	**3052.89**		

Source: Calculated data from Bihar through Figures, 2001 & 2018

The overall land available in the district of Jamui in 2000-01 is 3052.89 km^2 out of which 928.5 sqkm area is under the forest cover, cultivable Westland is 104.82 km^2, Current Fallow Loan is 326.08 km^2, Other than Fallow Land is 169.63 km^2Barren and Uncultivated Land is 289.01 km, Land put to non-agricultural Land is 392.68 sqkm, Area under Pasture is 17.25 sqkm, Area under bush, forest and garden is 19.16 sqkm and Net sown Area is 805.71 sqkm. whereas in the 2017-18 the 928.5 sqkm area is under the forest cover shows no change in the forest cover whereas the cultivable Westland is 102.81 sqkm, Current Fallow Land is 385.41 sqkm, Other than Fallow Land is 159.79 sqkm Barren and Uncultivated Land is 285.67 sqkm, Land put to non-agricultural Land is 445.45 sqkm, Area under Pasture is 16.37 sqkm, Area under bush, forest and garden is 21.40sqkm and Net sown Area is 707.44 sqkm. The Change detection is seen in the land use pattern in which forest has shown no change during the 2000-01 to 2017-18 period. Decrease in the Cultivable Wasteland, Other than Fallow Land, Barren and Uncultivated Land, Area under Pasture, Net Sown Area have been seen which is -1.91%, -5.8%, -1.15%, -5.1%, -12.19% respectively. Whereas Increase in the Current Fallow Land, Land put to non-agricultural Land, Area under bush, forest and garden can be observed which is 18.19%, 13.43% and 11.69% respectively. Further substitutes of Landuse can be seen from the Table-3.2 shown below through which we can infer that, Jamui and Sikandra Blocks are good in the Cropping area.

Figure:1

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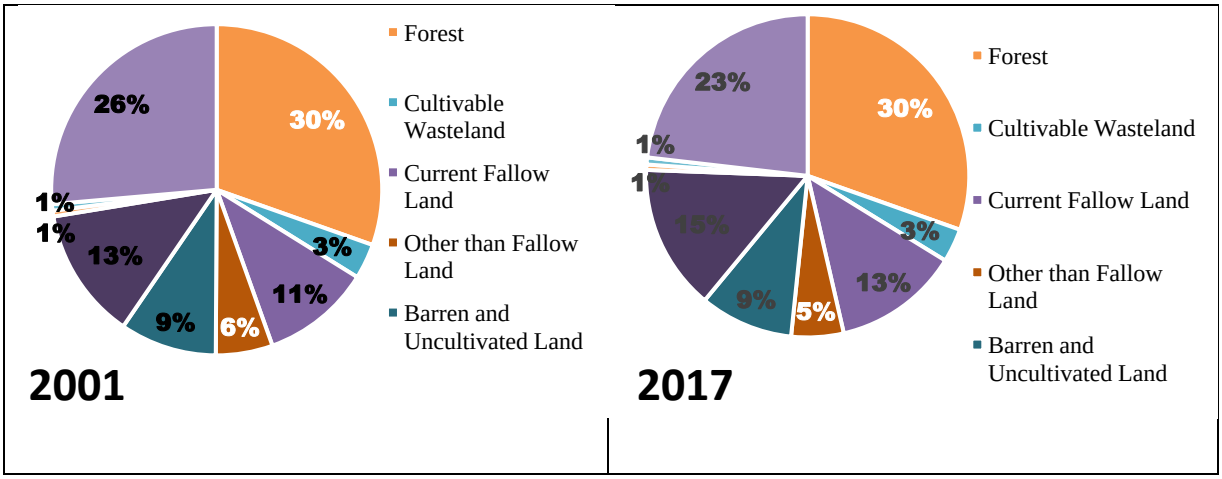

Source: Calculated data from Bihar through Figures, 2001 & 2018

The Overall Land available in the district is 3052.89 Km² Forest (30%), Cultivable Wasteland (3%), Current Fallow Land (11%), Other than Fallow Land (6%), Barren and Uncultivated Land (9%), Land put to non-agricultural Land (13%), Area under Pasture and Area under bush, forest and Garden (1%) and Net sown area (26%).

SN.	BLOCKS	TOTAL REPORTED AREA (in Km²)		FOREST			LAND NOT AVAILABLE FOR CULTIVATION					
							Land put to non-agricultural Land			Barren and Uncultivated Land		
		2000	2017	2000	2017	Changes	2000	2017	Changes	2000	2017	Changes
1	Barhat	232.1	232.1	13.2	12.2	-27.3	0.78	0.77	-0.01	27.0	26.6	-0.37
2	Chakai	774.0	774.0	23.2	23.1	-37.1	144.8	165.2	20.3	34.1	33.5	-0.59
3	Gidhaur	71.1	71.1	0.2	0.3	-9.8	11.6	13.8	2.2	2.5	2.5	-0.03
4	Aliganj	172.8	172.8	7.8	1.8	-25.9	13.8	14.8	1.0	8.7	8.6	-0.1
5	Jamui	173.9	173.9	0.4	0.5	-55.2	18.5	25.5	6.9	5.7	5.7	-0.03
6	Jhajha	417.5	417.5	7.5	8.7	24.0	59.8	62.3	2.4	94.1	93.0	-1.0
7	Khaira	418.7	418.7	16.8	22.8	70.1	47.4	49.3	1.9	36.2	36.1	-0.11
8	Lakshmipur	251.7	251.7	5.3	9.3	51.4	17.3	21.8	4.4	34.0	33.2	-0.79
9	Sikandra	184.0	184.0	6.4	2.6	-4.9	31.5	34.4	2.8	4.1	4.4	0.25
10	Sono	392.2	392.2	6.5	11.7	14.7	46.7	57.3	10.6	42.1	41.6	-0.48
	District	**3088.3**	**3088.3**	**92.8**	**92.85**	**0**	**392.6**	**445.4**	**52.7**	**289.01**	**285.6**	**-3.3**

Table 2, Assessment of Block wise Landuse pattern in Jamui district, (2000-2017)

Source- Calculated data from Bihar through Figures, 2001 & 2018

3.1. Forest

Forest is an important factor in the Landuse of any region, which plays the pivotal role in the distribution of overall land into different segments as per the regional use. The population

which has been carried by the land gets natural requirements through the forest and it has been unevenly distributed in the Jamui district. The total reported are of the district is 3088.38 Km^2 out of which 92.85 Km^2. It has been observed from Agriculture department's records that in 2000-01, Forest Area is 928.55 Km². Chakai accounts the highest 232.4 Km² in terms of Forest followed by Barhat which is 132.9Km². whereas Gidhaur accounts the lowest among all. Whereas in 2017-18, Forest Area remained unchanged and is 928.55 Km², Chakai accounts the highest in terms of Forest followed by Khaira which is 1158.2 Km². whereas Sikandra accounts the lowest among all. Overall change is zero but the maximum positive and negative change is seen in the Lakshmipur and Aliganj which is 36.95% and -55.1% respectively (Table 2).

Land Not Available For Cultivation

Land not suitable for agriculture: This category includes two categories of land: I land used for non-agricultural purposes and (ii) sterile and uncultivable waste. Non-agricultural land comprises land used by villages, cities, bridges, railways, or land under water, such as rivers, reservoirs, canals, tanks, dams, and other bodies of water.

Land put to non-agricultural Land

It has been observed from Agriculture department's records that in 2000-01, It has been observed from Agriculture department's records that in 2000-01, Land put to non-agricultural use is 329.68 Km². out of which Chakai accounts the highest 144.87 Km² in terms of Forest followed by Jhajha which is 59.86 Km². Whereas Gidhaur accounts the lowest among all 11.67 Km². Whereas in 2017-18, Land put to non-agricultural use changed and is 445.45 Km², among all Chakai accounts the highest 165.23 Km² in terms of Land put to non-agricultural use followed by Jhajha which is 62.32 Km². whereas Sikandra accounts the lowest among all. Overall change is positive 52.77 Km² and the maximum positive and negative change is seen in the Jamui and Barhat Blocks which is 37.2% % and -1.28 % respectively (Table-3.4).

Barren and Uncultivated Land

It has been observed from Agriculture department's records that in 2000-01, Barren and Uncultivated Land use is 289.01 Km². out of which Jhajha accounts the highest 94.12 Km² in terms of Forest followed by Khaira which is 36.24 Km². Whereas Gidhaur accounts the

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lowest among all 4.19 Km². Whereas in 2017-18, Barren and Uncultivated Land changed and is 285.67 Km², among all Jhajha accounts the highest 93.03Km² in terms of Barren and Uncultivated Land followed by Jhajha which is 62.32 Km². whereas Gidhaur accounts the lowest among all which is 2.56 Km² . Overall change is negative -3.34 Km² and the maximum positive and negative change is seen in the Lakshmipur and Sikandra Blocks which is 5.96% and -2.31% respectively (Table-3.4).

Table 3, Fallow land and other uncultivated land excluding fallow land

S.N	Blocks	FALLOW LAND(Km²)						OTHER UNCULTIVATED LAND EXCLUDING FALLOW LAND(Km²)								
		Current Fallow Land			Other than Fallow Land			Culturable Waste Land			Area Under Pasture			Area under bush, Forest and Garden		
		2000	2019	Change	2000	2019	Change	2000	2019	Change	2000	2018	Change	2000	2018	Change
1	Barhat	0.05	0.06	0.01	2.5	2.3	-0.15	3.3	3.24	-0.06	0.73	0.69	-0.04	4.21	0.1	-4.1
2	Chakai	72.7	85.9	13.2	39.7	37.3	-2.31	23.7	23.3	-0.46	5.44	5.17	-0.27	6.57	3.8	-2.6
3	Gidhaur	2.9	3.4	0.5	2.5	2.4	-0.15	2.68	2.62	-0.06	0.13	0.13	0	3.44	1.0	-2.3
4	Aliganj	13.7	16.2	2.5	3.07	2.8	-0.18	1.47	1.44	-0.03	0.32	0.3	-0.02	5.82	0.9	-4.8
5	Jamui	0.9	1.1	0.19	2.5	2.3	-0.15	0.59	0.58	-0.01	1.52	1.45	-0.07	3.57	1.2	-2.2
6	Jhajha	47.8	56.5	8.7	52.3	49.2	-3.03	22.2	21.8	-0.42	3.83	3.63	-0.2	7.36	3.6	-3.7
7	Khaira	40.4	47.7	7.3	23.4	22.0	-1.36	9.74	9.55	-0.19	1.3	1.23	-0.07	6.18	3.3	-2.8
8	Lakshmipur	76.3	90.3	13.9	25.8	24.3	-1.5	8.32	8.17	-0.15	1.4	1.33	-0.07	7.12	3.4	-3.6
9	Sikandra	42.5	50.2	7.7	3.1	3	-0.19	6.24	6.12	-0.12	0.88	0.84	-0.04	4.42	0.3	-4.0
10	Sono	28.5	33.7	5.1	14.4	13.6	-0.84	26.5	25.9	-0.51	1.7	1.6	-0.1	6.05	3.2	-2.7
	District	326.0	385.4	59.3	169.5	159.7	-9.86	104.8	102.8	-2.01	17.2	16.3	-0.88	54.7	21.4	-33.3

Source:- Calculated data from Bihar through Figures, 2001 & 2018

The Overall Land available in the district is 3052.89 Km² Forest (30%), Cultivable Wasteland (3%), Current Fallow Land (11%), Other than Fallow Land (6%), Barren and Uncultivated Land (9%), Land put to non-agricultural Land (13%), Area under Pasture and Area under bush, forest and Garden (1%) and Net sown area (26%).

Fallow Land

All arable land that is either part of a crop rotation scheme or is kept in good agricultural and environmental condition, whether worked or not, but will not be cultivated for the remainder of a crop year is considered fallow land. Fallow land is distinguished by the fact that it is left to regenerate for the duration of a crop year. Current Fallow Land and Other Than Fallow Land are two types of fallow land.

Current Fallow Land

It has been observed from Agriculture department's records that in 2000-01, It has been observed from Agriculture department's records that in 2000-01, Current Fallow Land is 326.08 Km². out of which Lakshmipur accounts the highest 76.78 Km² in terms of Current Fallow Land followed by Chakai which is 72.73 Km². Whereas Barhat accounts the lowest

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among all 0.05 Km². Whereas in 2017-18, Current Fallow Land increased to 385.41 Km², among all Lakshmipur accounts the highest 90.31 Km² in terms of Current Fallow Land followed by Chakai which is 85.96 Km². whereas Barhat accounts the lowest among all which 0.06 Km². Overall change is Negative -9.84 Km² and the maximum positive change is seen in the Barhat Block and followed by Jamui which 20 % and 19.19 % respectively (Table-3.5).

Other than Fallow Land

It has been observed from Agriculture department's records that in 2000-01, It has been observed from Agriculture department's records that in 2000-01, Other than Fallow Land is 169.63 Km². out of which Jhajha accounts the highest 52.31 Km² in terms of Other than Fallow Land followed by Chakai which is 39.7 Km². Whereas Barhat accounts the lowest among all 2.5 Km². Whereas in 2017-18, Other than Fallow Land decreased to 159.79 Km², among all Jhajha accounts the highest 52.31 Km² in terms of Other than Fallow Land followed by Chakai which is 37.39 Km². whereas Sikandra accounts the lowest among all which is 3 Km² . Overall change is negative -9.84 Km² and the maximum negative change is seen in the Lakshmipur Block which is -5.9% and followed by Khaira which is -5.8% respectively (Table-3.5).

Other Uncultivated Land Excluding Fallow Land

Culturable Waste Land

It has been observed from Agriculture department's records that in 2000-01, Culturable Waste Land is 104.82 Km² out of which Sono accounts the highest 26.5 Km² in terms of Culturable Waste Land followed by Chakai which is 23.76 Km². Whereas Jamui accounts the lowest among all 0.59 Km². Whereas in 2017-18, Culturable Waste Land decreased to 102.81 Km², among all Sono accounts the highest 25.99 Km² in terms of Culturable Waste Land followed by Chakai which 23.3 Km². whereas Jamui accounts the lowest among all which is 0.58 Km² . Overall change is negative -2.01 Km² and the maximum negative change is seen in the Gidhaur Block which is-2.23 % and followed by Aliganj which is -2.04 % respectively (Table-3.6).

Area under pasture

It has been observed from Agriculture department's records that in 2000-01, It has been observed from Agriculture department's records that in 2000-01, Area Under Pasture is 17.25

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Km². out of which Chakai accounts the highest 5.44 Km² in terms of Area Under Pasture followed by Jhajha which is 3.83 Km². Whereas Gidhaur accounts the lowest among all 0.13 Km². Whereas in 2017-18, Area Under Pasture decreased to 16.37 Km², among all Chakai accounts the highest 5.17 Km² in terms of Area Under Pasture followed by Jhajha which is 3.63 Km². whereas Gidhaur accounts the lowest among all which is 0.13 Km² . Overall change is negative -2.01Km² and the maximum negative change is seen in the Lakshmipur Block which is -6.25% and followed by Sono which is -5.88% respectively (Table-3.6).

Area under bush, Forest and Garden

It has been observed from Agriculture department's records that in 2000-01, It has been observed from Agriculture department's records that in 2000-01, Area Under bush, Forest and Garden is 19.16 Km². out of which Chakai accounts the highest 3.57 Km² in terms of Area Under bush, Forest and Garden followed by Khaira which is 3.18 Km². Whereas Barhat accounts the lowest among all 0.21 Km². Whereas in 2017-18, Area Under bush, Forest and Garden increased to 21.4 Km², among all Chakai accounts the highest 3.89 Km² in terms of Area Under bush, Forest and Garden followed by Jhajha which is 3.64 Km². whereas Barhat accounts the lowest among all which is 0.11 Km² . Overall change is Positive which is 2.24 Km² and the maximum Positive and negative change is seen in the Jamui and Jhajha Blocks which is 573.68% and -12.5% respectively (Table-3.6).

SN.	BLOCKS	Agricultural land (Km²)					
		2000-01		2017-18		Change	
		Km²	%	Km²	%	Km²	%
1	Barhat	47.27	5.86	31.51	4.4	-15.76	-1.41
2	Chakai	161.27	20.01	111.6	15.7	-49.67	-4.24
3	Gidhaur	34.02	4.22	29.87	4.2	-4.15	-0.0004
4	Aliganj	93.11	11.55	91.75	12.9	-1.36	1.41
5	Jamui	83.11	10.31	52.98	7.4	-30.13	-2.82
6	Jhajha	70.07	8.69	101.52	14.3	31.45	5.65
7	Khaira	80.82	10.03	70.96	10.0	-9.86	-0.001
8	Lakshmipur	45.01	5.58	39.57	5.5	-5.44	0.006
9	Sikandra	63.88	7.92	56.08	7.9	-7.8	-0.001
10	Sono	127.1	15.77	121.6	17.1	-5.5	1.41
		805.66		**707.44**		**-98.22**	

Table 4, Block wise agricultural land use change

Source:- Calculated data from Bihar through Figures, 2001 & 2018

It has been observed from Agriculture department's records that in 2000-01, Net Sown Area is 805.66 Km². out of which Chakai accounts the highest 161.27 Km² in terms of agricultural land followed by Sono which is 127.1 Km². Whereas Gidhaur accounts the lowest among all 34.02 Km². Whereas in 2017-18, Net Sown Area decreased to 707.44 Km², among all Sono accounts the highest 121.6 Km² in terms of Net Sown Area followed by Chakai which is 111.6 Km². whereas Gidhaur accounts the lowest among all which is 37.12 Km². Overall change is negative which is -98.22 Km² and the maximum Positive and negative change is seen in the Jhajha and Barhat Blocks which is 44.88 % and -33.34% respectively (Table-3.7).

Conclusion

From all above study in this paper, the general land use pattern and agricultural land use pattern are directly proportional to each other. If general land use will get affected or changed at various stages, the agricultural land use pattern will also get affected and changed as we observed for the Jamui district. The chapter also point outs the lack of irrigation facilities along the district and block wise, which is either very much Limited or in the very poor condition from the infrastructural point of view. From all about discussions it is very much clear that the general land use pattern connected with the agricultural land use pattern and highly dependent upon each other and general land use will get affected or decreased or changed various components of the agricultural land use will experience change and will be observed to the different parameters in the Jamui district. The chapter also performance assessment of land use in Jamui and its changing behaviour clockwise. The agricultural land use under the assessments during the year 2001-19. Agricultural land distribution and condition is also been checked and availability of agricultural land is decreasing it is evaluated. Where is decreasing land use pattern of land use is also been in the chapter. Also demographic and Agriculture production relationship and land use Matrix change has also been under the assessment about this chapter. digital crop production spin under the lenses also with the change are also discussed in this chapter dedicated assessment of land use change agricultural land use change are also discussed whereas the changing agricultural land due to different parameters of forest settlement also discussed. soil distribution and impact of agriculture where is impact on agriculture through the crop and agricultural land ratio collated and projected in a table form which shoes cultural and ratio is decreasing which concludes that with the land use pattern change the change can be seen on the agricultural

land use change will be seen in terms of agriculture land ratio which will result into the change in the cropping pattern. Cropping pattern and their types are also discussed whereas the parameters of cropping pattern from map analysis are also part of the discussion the crop amalgamation region to the irrigation facilities are you under the discussion which concludes words swimming land use but increasing productivity in the district. Jamui District is also struggling from the low rainfall pattern, because of its geographical position of Rainfed area conditions and also there are negligence from the planning division of irrigation at the basic and local level. The crop intensity in the district are in the better condition, which shows the capability of land and the people engaged in the primary activities especially in the crop production. The district shows the differences in the land use pattern block wise where compositions for the land use is not uniform in the block division level. The land use pattern is uneven in the district when we go through the block wise Landuse classification in the particular. Landuse- Landcover composition in the blocks of Jamui district are very much difference at the level of hill area, agricultural areas, the settlement areas, the vegetation areas and rivers and streams are also unevenly distributed all along the district. The water body area is only in the fractional value among land use factors shows the poor water body contain by the district which ultimately affects the irrigation facilities because irrigation infrastructure from the ultimately effects the crop production and crop pattern.

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	Area	F1	L1	B1	C1	O1	CW1	A1	AU1	N1	AS1	G1

Correlations

		Area	F1	L1	B1	C1	O1	CW1	A1	AU1	N1	AS1	G1
2	Pearson Correlation	1	.825**	.940**	.532	.652*	.753*	.797**	.900**	.635*	.790**	.535	.779**
	Sig. (2-tailed)		.003	.000	.114	.041	.012	.006	.000	.048	.007	.111	.008
	N	10	10	10	10	10	10	10	10	10	10	10	10
F1	Pearson Correlation	.825**	1	.710*	.277	.465	.462	.436	.588	.450	.577	.290	.562
	Sig. (2-tailed)	.003		.022	.438	.176	.179	.208	.074	.192	.081	.417	.091
	N	10	10	10	10	10	10	10	10	10	10	10	10
L1	Pearson Correlation	.940**	.710*	1	.382	.637*	.697*	.745*	.915**	.502	.803**	.624	.798**
	Sig. (2-tailed)	.000	.022		.277	.048	.025	.014	.000	.139	.005	.054	.006
	N	10	10	10	10	10	10	10	10	10	10	10	10
B1	Pearson Correlation	.532	.277	.382	1	.448	.866**	.720*	.608	.751*	.161	.023	.153
	Sig. (2-tailed)	.114	.438	.277		.194	.001	.019	.062	.012	.656	.949	.674
	N	10	10	10	10	10	10	10	10	10	10	10	10
C1	Pearson Corre.	.652*	.465	.637*	.448	1	.738*	.574	.633*	.792**	.332	.187	.325
	Sig. (2-tailed)	.041	.176	.048	.194		.015	.083	.049	.006	.348	.604	.359
	N	10	10	10	10	10	10	10	10	10	10	10	10
O1	Pearson Corre.	.753*	.462	.697*	.866**	.738*	1	.746*	.838**	.829**	.348	.198	.341
	Sig. (2-tailed)	.012	.179	.025	.001	.015		.013	.002	.003	.324	.583	.335

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	N	10	10	10	10	10	10	10	10	10	10	10	10
CW1	Pearson Correlation	.797**	.436	.745*	.720*	.574	.746*	1	.760*	.673*	.660*	.435	.650*
	Sig. (2-tailed)	.006	.208	.014	.019	.083	.013		.011	.033	.038	.209	.042
	N	10	10	10	10	10	10	10	10	10	10	10	10
A1	Pearson Correlation	.900**	.588	.915**	.608	.633*	.838**	.760*	1	.577	.670*	.598	.671*
	Sig. (2-tailed)	.000	.074	.000	.062	.049	.002	.011		.081	.034	.068	.034
	N	10	10	10	10	10	10	10	10	10	10	10	10
AU1	Pearson Correlation	.635*	.450	.502	.751*	.792**	.829**	.673*	.577	1	.374	.203	.366
	Sig. (2-tailed)	.048	.192	.139	.012	.006	.003	.033	.081		.286	.574	.299
	N	10	10	10	10	10	10	10	10	10	10	10	10
N1	Pearson Correlation	.790**	.577	.803**	.161	.332	.348	.660*	.670*	.374	1	.855**	.999**
	Sig. (2-tailed)	.007	.081	.005	.656	.348	.324	.038	.034	.286		.002	.000
	N	10	10	10	10	10	10	10	10	10	10	10	10
AS1	Pearson Correlation	.535	.290	.624	.023	.187	.198	.435	.598	.203	.855**	1	.874**
	Sig. (2-tailed)	.111	.417	.054	.949	.604	.583	.209	.068	.574	.002		.001
	N	10	10	10	10	10	10	10	10	10	10	10	10
G1	Pearson Correlation	.779**	.562	.798**	.153	.325	.341	.650*	.671*	.366	.999**	.874**	1

Sig. (2-tailed)	.008	.091	.006	.674	.359	.335	.042	.034	.299	.000	.001	
N	10	10	10	10	10	10	10	10	10	10	10	10

**. Correlation is significant at the 0.01 level (2-tailed).

*. Correlation is significant at the 0.05 level (2-tailed).